HE
11/2:S73
1992
C.2

North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

THOROUGHFARE PLAN

FOR

SPARTA

ALLEGHANY COUNTY

N.C. DOCUMENTS
CLEARINGHOUSE

JUN 24 1992

N.C. STATE LIBRARY
RALEIGH

1992

Digitized by the Internet Archive
in 2012 with funding from
LYRASIS Members and Sloan Foundation

http://archive.org/details/thoroughfare1992nort

THOROUGHFARE PLAN

FOR

SPARTA, NORTH CAROLINA

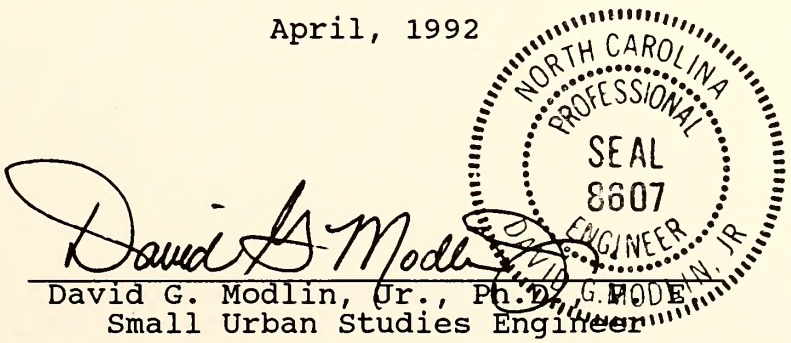
Prepared by the :

Statewide Planning Branch
Division of Highways
N. C. Department of Transportation

In Cooperation with:

The Town of Sparta
The Federal Highway Administration
U. S. Department of Transportation

April, 1992



David G. Modlin, Jr., Ph.D., P.E.
Small Urban Studies Engineer

Persons Responsible for this Report:

Manager Statewide Planning Branch:	Dr. M. R. Poole, P.E.
Small Urban Studies Engineer:	Dr. D. G. Modlin, Jr.,P.E.
Project Engineer:	E. Richard Capps, Jr.
Engineering Technician:	Jason Galloway

125 copies of this document were printed at a cost of $211.00, or $1.69 per copy (GS. 143-170.1)

TABLE OF CONTENTS

I. INTRODUCTION 1

II. THOROUGHFARE PLANNING PRINCIPLES 3

A. Objectives 3
B. Operational Efficiency 4
C. System Efficiency 5
1. Functional Classification 5
a. Local Access Streets 7
b. Minor Thoroughfares 7
c. Major Thoroughfares 7
2. Idealized Major Thoroughfare System 7
a. Radial Streets 7
b. Crosstown Streets 7
c. Loop System Streets 8
d. Bypass 8
D. Application of Thoroughfare Planning Principles . 8

III. EXISTING AND PROJECTED CONDITIONS 11

A. Existing System 11
B. Population Characteristics 15
C. Economy and Employment 15
D. Travel Demand 19
E. Capacity Analysis 19
F. Traffic Accident Statistics 24

IV. MUNICIPAL AND PUBLIC INVOLVEMENT 29

V. SPARTA THOROUGHFARE PLAN 31

A. Major Thoroughfare System 31
B. Minor Thoroughfare System 32

VI. CONSTRUCTION IMPROVEMENTS, BENEFITS AND COST ESTIMATES 35

VII. ADMINISTRATION CONTROLS AND IMPLEMENTATION TOOLS .. 39

A. State Municipal Adoption of the Thoroughfare Plan 39
B. Available Controls and Tools 40
1. Subdivision Regulations 40
2. Zoning Ordinances 40
3. Official Maps 41
4. Urban Renewal 43
5. Capital Improvement Program 43
6. Development Reviews 43

APPENDIX A: THOROUGHFARE PLAN STREET TABULATIONS A-1
APPENDIX B: TYPICAL CROSS SECTIONS B-1
APPENDIX C: RECOMMENDED SUBDIVISION ORDINANCES C-1

LIST OF TABLES

TABLE		PAGE
1.	Population	14
2.	High Accident Locations	22
3.	Environmental Considerations	34
4.	Benefits Evaluation	35
5.	Project Funding Sources	45

LIST OF FIGURES

FIGURE		PAGE
1.	Geographic Location	2
2.	Ideal Small Urban Thoroughfare Plan	6
3.	Sparta Planning Area	13
4.	Significant Land Use	17
5.	Average Daily Traffic	21
6.	Levels of Service	23
7.	Accident Locations	25
8.	Sparta Thoroughfare Plan	33
9.	Typical Thoroughfare Cross Sections	B-3

I. INTRODUCTION

Sparta is located in the center of Alleghany County on the Virginia border in the northwestern part of North Carolina (See Figure 1). It is the financial and governmental center of Alleghany County and the County Seat. Highway access is via US 21 and NC 18. US 21 runs southeast to northwest through town; NC 18 runs southwest to northeast through town. US 21 and NC 18 intersect in the center of Sparta.

The present population of Sparta is approximately 1,957, which makes it a relatively small town. However, the population growth trend of the area and the concentration of travel along two of the major thoroughfares are causing the existing transportation system to feel a strain, especially in the downtown area.

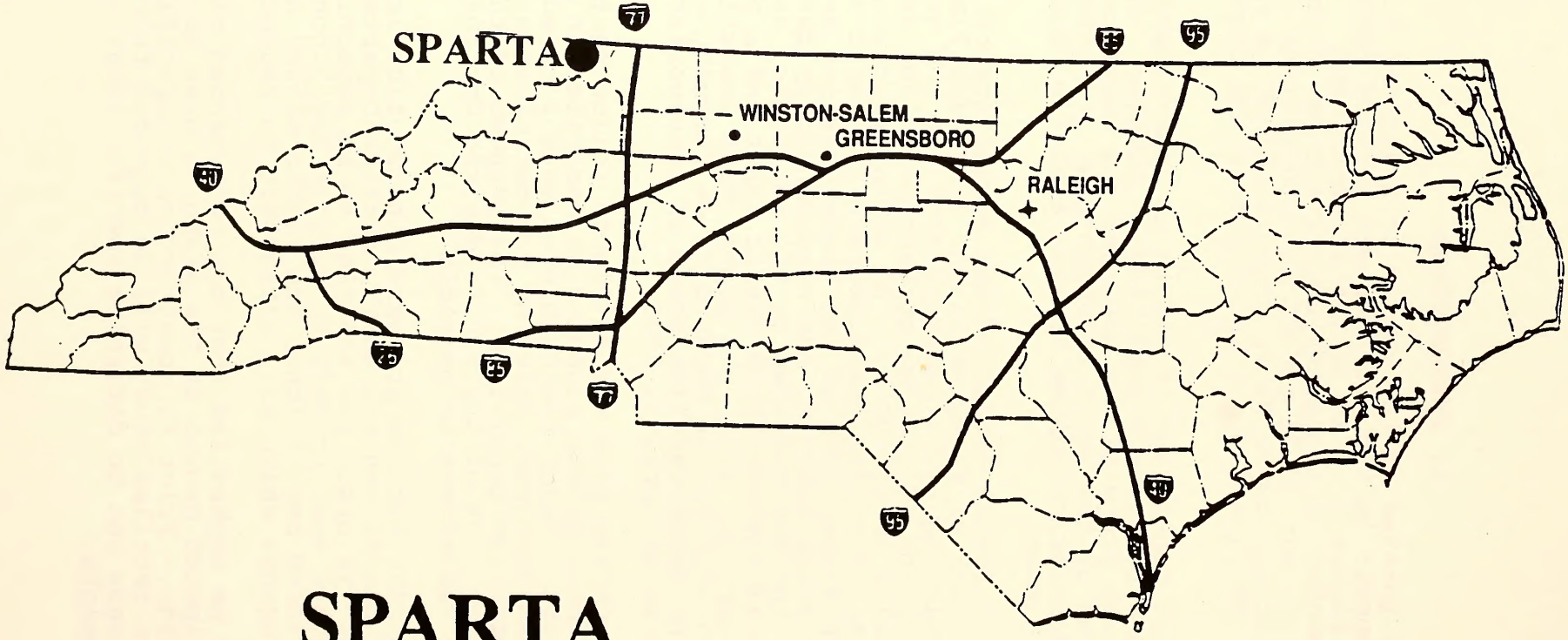
The Town of Sparta requested the assistance of the North Carolina Department of Transportation, Statewide Planning Branch, in developing a thoroughfare plan for the area in response to concerns of growing congestion in the downtown area, specifically at the US 21 - NC 18 intersection. Town Council members, Planning Board members and local citizens participated in discussions of the transportation needs of the area. Two plans emerged, one recommended by the Department and another promoted by the merchants, and following several meetings with public input and a public hearing on January 23, 1992, the Sparta Town Council adopted the plan recommended by the Department on February 4, 1992. Subsequently the North Carolina Board of Transportation adopted this plan on April 3, 1992.

The thoroughfare plan was developed following the basic principles of thoroughfare planning as described in Chapter II of this report. Major thoroughfares were located based upon field investigations, existing and anticipated land uses, and topographic conditions. The purpose of the plan is to facilitate the flow of traffic to desired destinations with as little resistance as possible.

Responsibility for the proposed construction is shared by the Town of Sparta and the North Carolina Department of Transportation. In order for the plan to be effective, both the Town and State must protect by various legal controls, such as subdivision regulations, the rights-of-way necessary for the improvements which will ultimately be requested.

It should be emphasized that the recommended plan is based on anticipated growth of the planning area as indicated by current trends. Prior to construction of specific projects a more detailed study will be required to reconsider development trends and to determine specific location and design requirements.

GEOGRAPHIC LOCATION



SPARTA

ALLEGHANY COUNTY
NORTH CAROLINA

FIGURE 1

II. THOROUGHFARE PLANNING PRINCIPLES

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area.

Objectives

The primary purpose of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with changing traffic demands. Through proper planning for street development, many costly errors and much needless expense can be averted. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and help eliminate unnecessary improvements. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be obtained that will require a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population and commercial and industrial enterprises affects major street and highway location. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. To provide for the orderly development of an adequate major street system as land development occurs;

2. To reduce travel and transportation costs;

3. To reduce the cost of major street improvements through coordination with private action;

4. To enable private interest to plan their actions, improvements, and development with full knowledge of public intent;

5. To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;

6. To reduce environmental impacts such as air pollution, resulting from transportation;

7. To increase travel safety.

Thoroughfare planning objectives are achieved through both: (1) improving the operational efficiency of thoroughfares; and (2) improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined as the maximum number of vehicles which can pass a given point of a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include street widening, intersection improvements, improving vertical and horizontal alignment, and eliminating roadside obstacles. For example, widening of a street from two to four travel lanes more than doubles the capacity of the street by providing additional maneuverability for traffic. Impedances to traffic flow caused by slow moving or turning vehicles and adverse effects of horizontal and vertical alignments are thus reduced.

Operational ways to improve street capacity include:

1. **Control of access** - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.

2. **Parking removal** - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.

3. **One-way operation** - The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

4. **Reversible lanes** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

5. **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced in the following ways:

1. Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.

2. Encourage the use of transit and the bicycle mode.

3. Encourage industries, business, and institutions to stagger work hours or establish variable work hours for employees. This will reduce travel demand in peak periods and spread peak travel over a longer time period.

4. Plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions--traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property lead to intolerable traffic flow, friction, and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to function as local access streets, minor thoroughfares, and major thoroughfares (See Figure 2).

IDEAL SMALL URBAN THOROUGHFARE PLAN

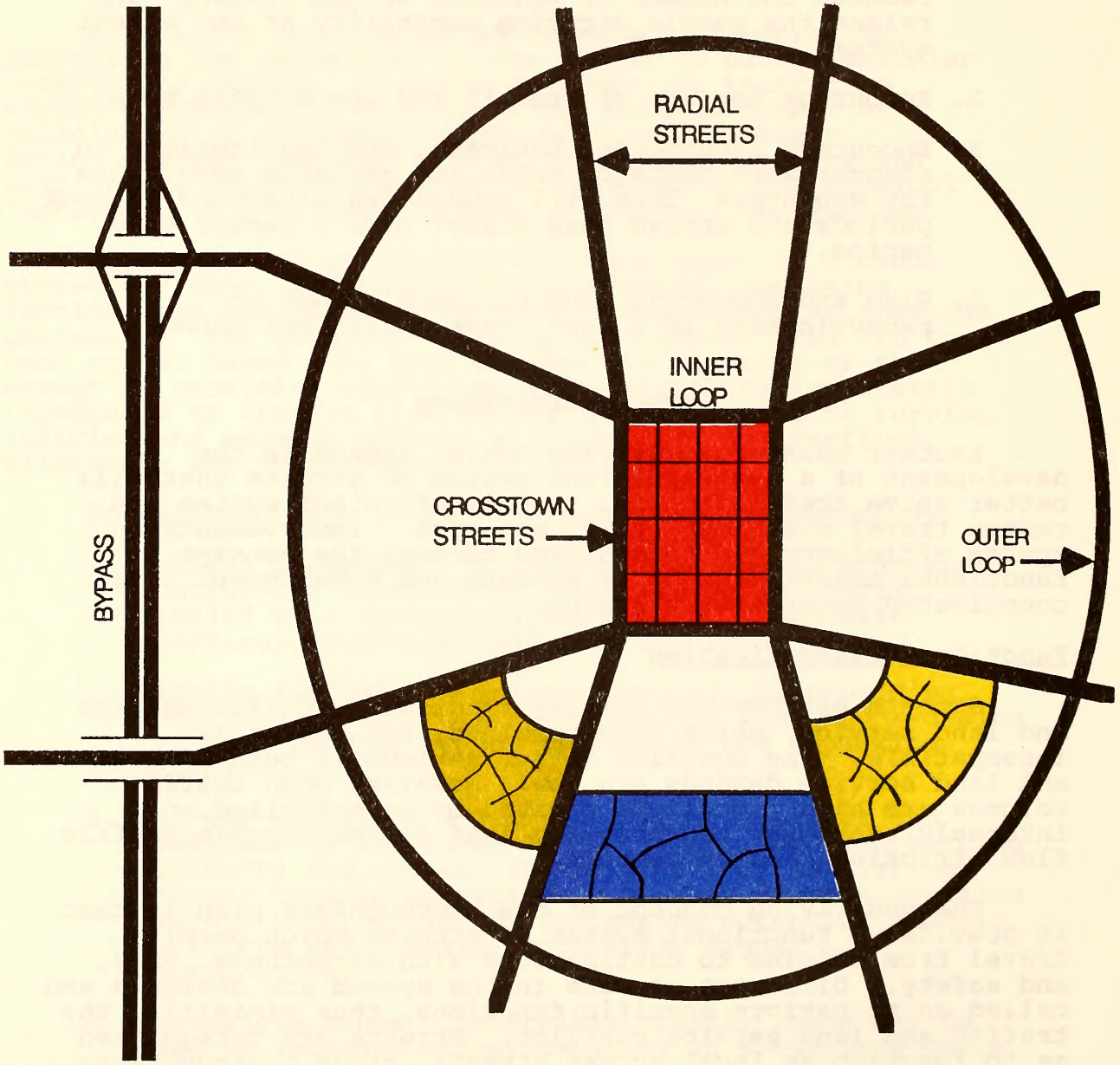


FIGURE 2

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets would be served. Local streets may be further classified as either **residential, commercial,** and/or **industrial** depending upon the type of land use which they serve.

Minor Thoroughfares are more important streets in the system. They collect traffic from local access streets and carry it to the major thoroughfare system. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function which may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property, however, **their major function is to carry** traffic. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and a hindrance to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfare forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area and which permits movement between various areas of the city with maximum directness is the radial-loop system. This system consists of several functional elements-radial streets, crosstown streets, loop system streets, and bypasses (See Figure 2).

Radial streets provide for traffic movement between points located in the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the ability of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of **crosstown streets** which form a loop around the central business district. This system allows traffic moving from origins on

one side of the central area to destinations on the other to follow the area's border and allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area, and they are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A **bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to through highway standards, with control of access. On occasions a bypass with a low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are as follows:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as the factors that contribute to it, limit it, and modify it.

2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on relatively few streets.

3. The plan should conform to and provide for the land development plan of the area.

4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas which have development potential, it is necessary to designate thoroughfares on a long-range development.

5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

III. EXISTING CONDITIONS

A fire in 1933 burned most of Sparta including the courthouse and most of the businesses and homes. The citizens worked together to rebuild their village and have continued to invest their time and money in a valuable street system for the community. Development patterns, somewhat governed by the mountainous topography, have given a unique local character to Sparta. Developing a thoroughfare plan requires investigation into this character as well as the existing road network, population trends, economy and employment, travel demand and the capacity of the street system to meet this demand, and the traffic accident pattern which often points to deficiencies in the road network.

Today, Sparta is the center of activity for Alleghany County. The town and surrounding area support most of the County's industries, as well as the only hospital and high school. The County's major shopping area is also located in Sparta.

Existing System

Sparta is served by two primary roads, US 21 and NC 18. US 21 is commercially developed through town and growth is expected to continue along this route. NC 18, however, is bordered primarily by residential development with growth expected in the outlying areas southwest of town. The local government has also expressed interest in a light industrial complex, Alleghany County Industrial Park, between NC 18 and Grandview Drive. Other major local streets are Grandview Drive, Memorial Park Drive, Blue Ridge Street and Grayson Street.

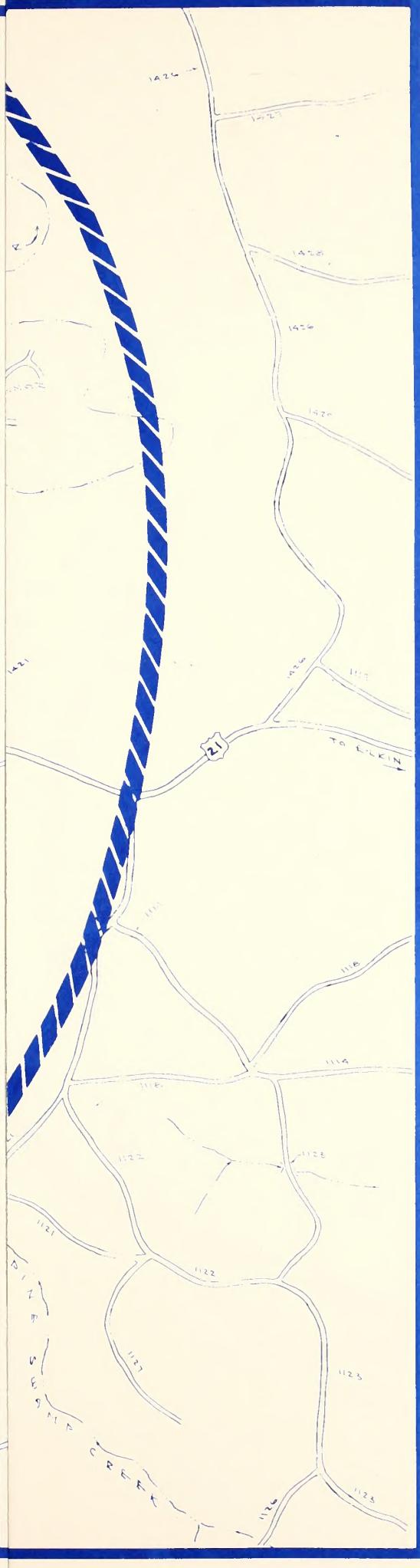
The thoroughfare plan study revealed several system deficiencies in Sparta's street network. System deficiencies include:

1. Two major routes, NC 18 and US 21, intersect in Sparta, forcing the majority of traffic to the center of Town,

2. The lack of circumferential and cross-town streets results in traffic using local streets to avoid the intersection of US 21 and NC 18, and

3. The lack of a US 21 alternate increases traffic and delay at the intersection of US 21 and NC 18.

The result of the deficiencies is the congested intersection of NC 18 and US 21. The existing geometrics at the intersection do not readily accommodate turning trucks and widening could not be accomplished without the destruction of several businesses at great expense.



SPARTA PLANNING AREA

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 3

SPARTA PLANNING AREA

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 3

Population Characteristics

Travel is directly related to population, and the volume of traffic on any section of roadway is closely related to the size and distribution of the population it serves. Population statistics for Alleghany County, Gap Civil Township, and Sparta are summarized in Table 1.

Population estimates from 1980 through 1990 show an increase in Sparta, while Alleghany County and the Gap Civil Township have remained constant. These statistics reflect the significance of Sparta as the County's major Town. Projections to 2020 show an increase in population for Sparta and the Gap Civil Township. The majority of growth in the Township can be attributed to the growth of Sparta.

TABLE 1 POPULATION

YEAR	ALLEGHANY COUNTY	GAP CIVIL TOWNSHIP	TOWN OF SPARTA
1960	7734	2475	1047
1970	8134	2862	1304
1980	9587	3640	1687
1990	9590	3676	1957
2000[a]	9481	3975	2280
2010[a]	9176	4300	2570
2020[a]	8747	4700	2800

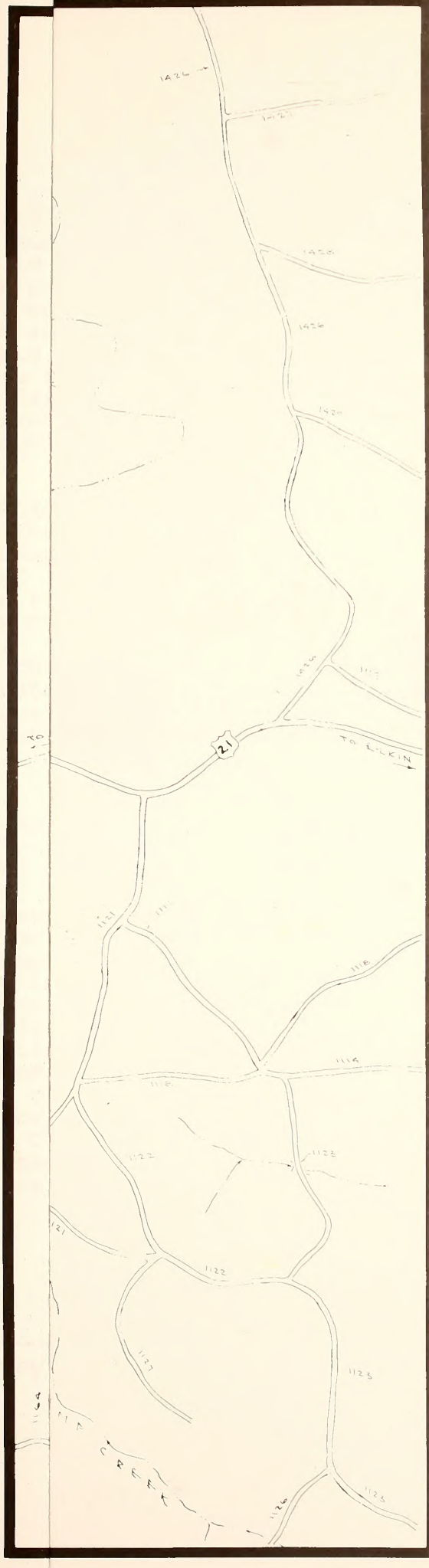
[a] estimated

The estimated population of the Sparta Planning Area is 2800 persons. With continued growth as projected, the 2020 planning area population is estimated to be 3600 persons.

Economy and Employment

Sparta is the center of economic activity in Alleghany County. I-77 is within 30 miles of Sparta to the east via US 21 and together they provide the primary distribution routes for goods and services. The Sparta area is the home for some recognized industry names, Hanes, Dr. Grabow Pipes, Modern Globe, Pioneer/Eclipse as well as other local businesses. Two shopping centers, Trojan Village and Sparta Squire, are just south of the downtown business district on the east side of and adjacent to US 21. The downtown business district appears healthy with a number of local shops, many offering local crafts for sale.

The 1990 County Profile indicates an average unemployment rate of 3.2% while neighboring Virginia counties have experienced unemployment rates in excess of 5%. As the Alleghany County Industrial Park begins to develop, employment opportunities should be enhanced.



SIGNIFICANT LAND USE

LEGEND

RESIDENTIAL

PUBLIC

COMMERCIAL

INDUSTRIAL

ADOPTED BY:

TOWN OF SPARTA _____

PLANNING AND ENVIRONMENTAL BRANCH _____

N. C. DEPARTMENT OF TRANSPORTATION _____

PUBLIC HEARING DATE _____

REVISIONS

TOWN OF SPARTA	PLANNING AND ENVIRONMENTAL	N.C. DEPARTMENT OF TRANSPORTATION

SPARTA

ALLEGHANY COUNTY

NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH

IN COOPERATION WITH

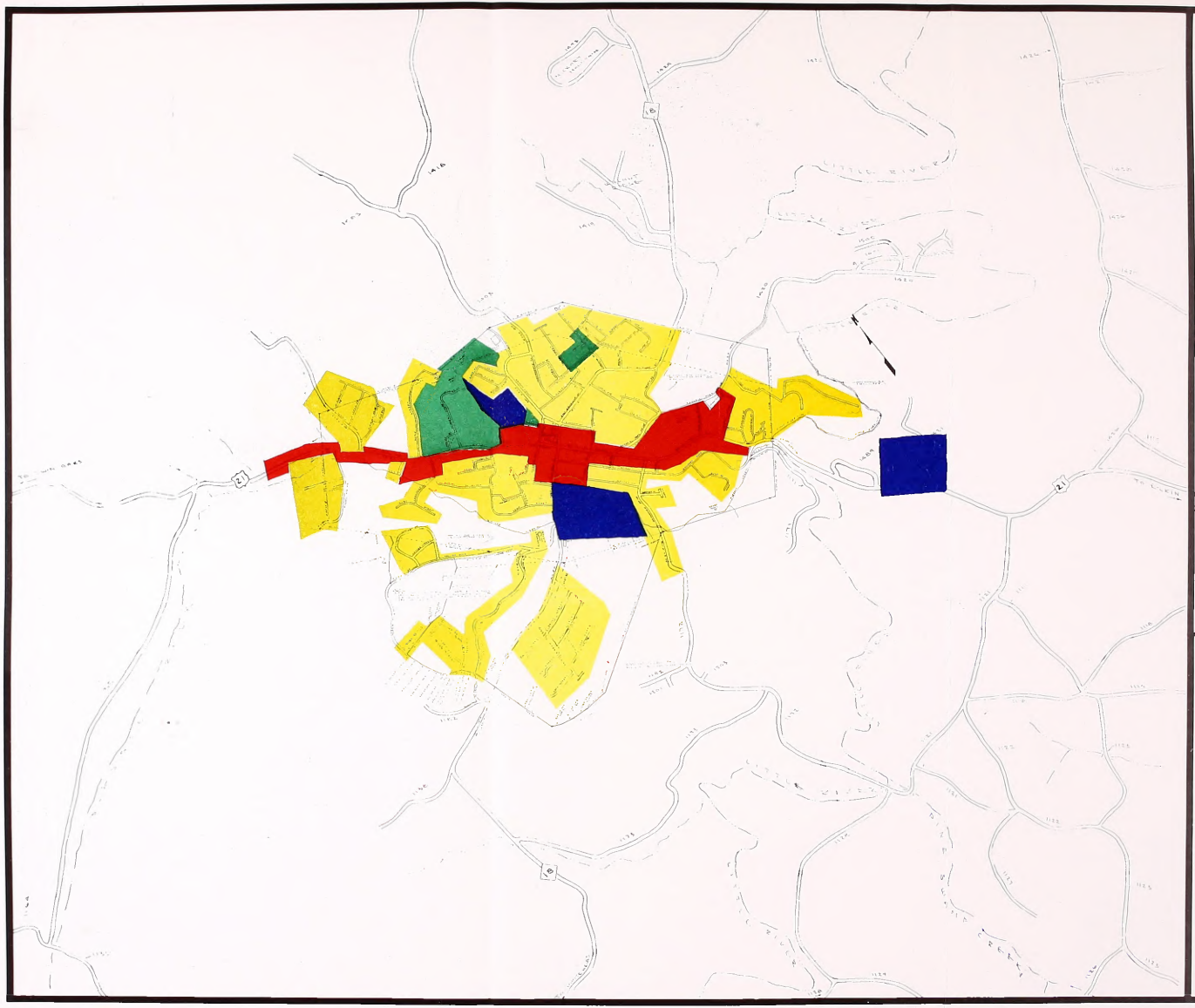
U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200

SCALE IN FEET

FIGURE 4



SIGNIFICANT LAND USE

LEGEND

- RESIDENTIAL
- PUBLIC
- COMMERCIAL
- INDUSTRIAL

ADOPTED BY:

TOWN OF SPARTA _____

PLANNING AND ENVIRONMENTAL BRANCH _____

N.C. DEPARTMENT OF TRANSPORTATION _____

PUBLIC HEARING DATE _____

REVISIONS

TOWN OF SPARTA	PLANNING AND ENVIRONMENTAL	N.C. DEPARTMENT OF TRANSPORTATION

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 4

Travel Demand

An allocation approach was used to develop a simplified traffic model for the Sparta area. Based on this model, in 1990 it is estimated that on an average day approximately 2,000 trips pass through Sparta, approximately 8,200 trips have either a home origin or work/shop destination in Sparta, and that an additional 12,500 trips are made entirely within the Sparta planning area. Based on an analysis of traffic growth in and around the Sparta area, the respective numbers for the design year 2020 are 3,600, 19,000, and 21,800 respectively. The analysis of traffic indicated annual growth during the last decade ranging from 2.0 - 4.7 percent.

On Main Street (US 21) just south of the intersection of NC 18, the growth has been an average 3.1 percent since 1980. Compounded to the design year 2020, the current volume of 12,200 vehicles per day would be expected to increase to nearly 30,000 vehicles per day. A reasonable capacity for this section of Main Street is 16,000 vehicles per day. Growth may indeed not continue on Main Street as it has for the past three decades; however, even very minor growth rates over the next thirty years will cause traffic on Main Street to break down without significant improvements and/or alternate routes.

Capacity Analysis

In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, the width of the pavement, and the traffic control devices utilized. Thus, the ability of a street to move traffic can be increased to some degree by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques. Capacity is defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given time period under prevailing roadway and traffic conditions[1]. The relationship of traffic volumes to the capacity of the roadway will determine the level of service being provided. Six levels of service have been selected to identify the conditions existing under various speed and volume conditions on any highway or street. The six levels of service[1] are:

---

[1] Highway Capacity Manual, 1985

Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic provided to the motorist, passenger, or pedestrian is excellent.

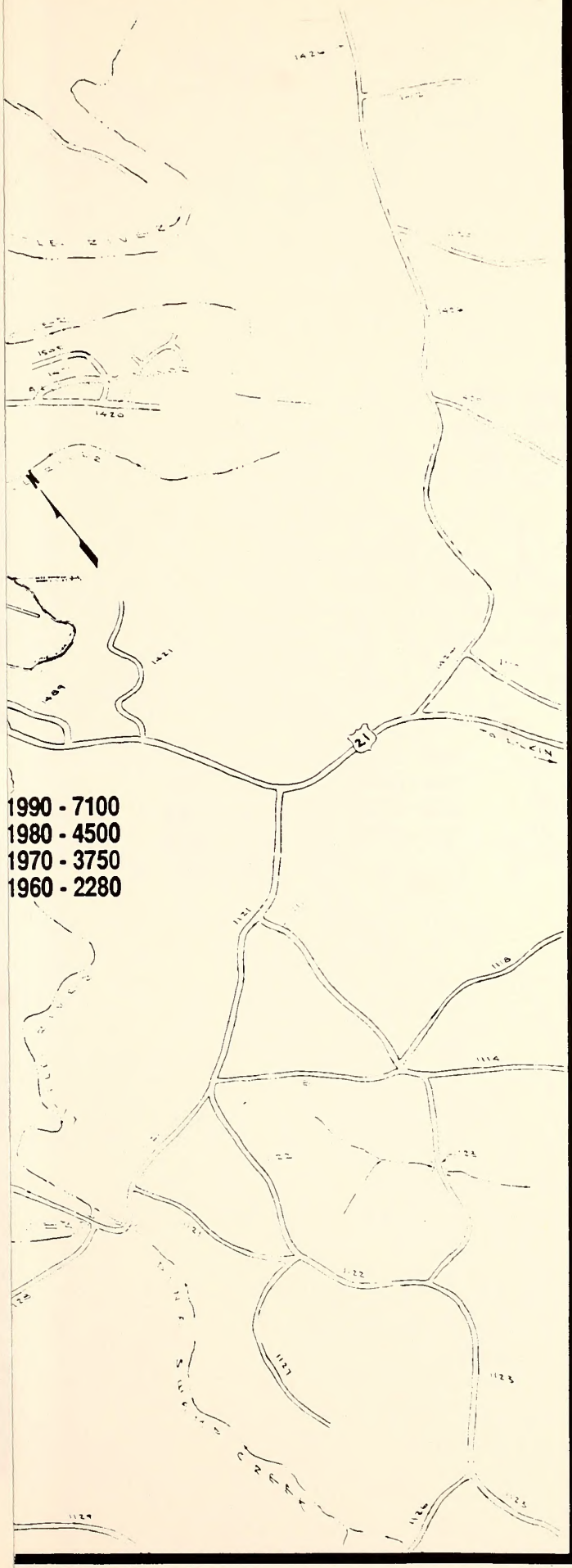
Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from level-of-service A. The level of comfort and convenience provided is somewhat less than at level-of-service A, because the presence of others in the traffic stream begins to affect individual behavior.

Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interaction with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial caution on the part of the user. The general level of comfort and convenience declines noticeable at this level.

Level-of-service D represent high-density, but stable flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Lines form behind such locations. Operations within the line are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a periodic fashion.



AVERAGE DAILY TRAFFIC

LEGEND

1990 - 0000 ADT
1980 - 0000 ADT
1970 - 0000 ADT
1960 - 0000 ADT

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 5

Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic provided to the motorist, passenger, or pedestrian is excellent.

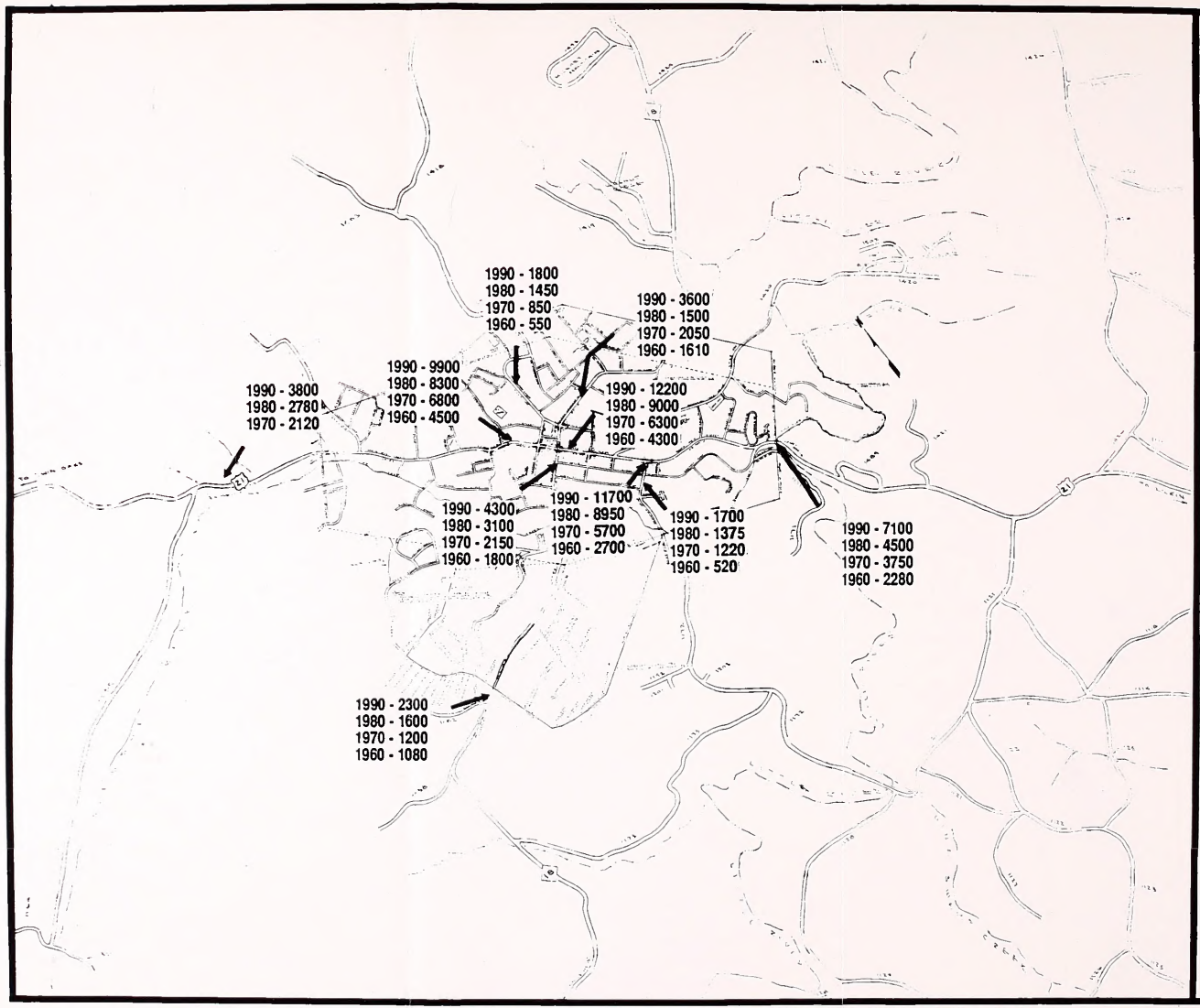
Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from level-of-service A. The level of comfort and convenience provided is somewhat less than at level-of-service A, because the presence of others in the traffic stream begins to affect individual behavior.

Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interaction with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial caution on the part of the user. The general level of comfort and convenience declines noticeable at this level.

Level-of-service D represent high-density, but stable flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.

Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Lines form behind such locations. Operations within the line are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a periodic fashion.



AVERAGE DAILY TRAFFIC

LEGEND

1990 - 0000 ADT
1980 - 0000 ADT
1970 - 0000 ADT
1960 - 0000 ADT

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

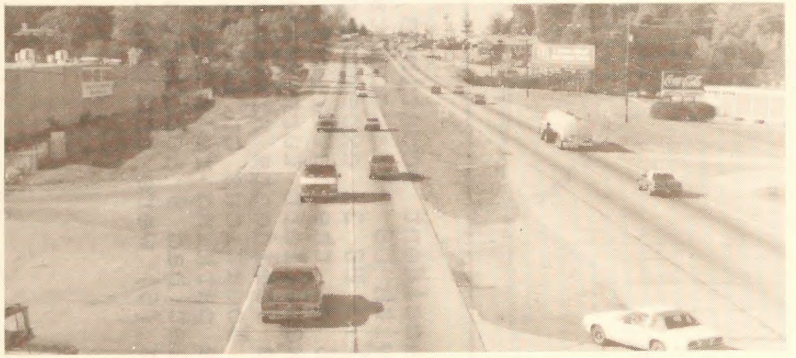
PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 5

LEVEL OF SERVICE - A

LEVEL OF SERVICE - D



LEVEL OF SERVICE - B

LEVEL OF SERVICE - E

LEVEL OF SERVICE - C

LEVEL OF SERVICE - F

LEVELS OF SERVICE

FIGURE 6

The purpose of calculating the capacities of the major links in the street network is to know how well the network could serve 2020 traffic and whether or not there would be any major deficiencies. With this objective in mind, the 2020 travel desires were assigned to the existing major street system. Deficient corridors created by the assigning of 2020 traffic to the existing network were then observed as discussed in Chapter III.

Presently, one deficient corridor exists in the Sparta planning area. A small section of US 21 between Sunset Drive and the South City Limits currently operates above capacity. By the design year, both NC 18 and US 21 through Sparta will be deficient if new roads are not constructed.

Traffic Accident Statistics

Accident records for May 1988 through May 1991 were investigated to determine high accident locations within Sparta. Targeted Areas had 5 accidents or more over the past 3 years. The investigation yielded seven locations, totaling 65 accidents. Table 2 has a list of the locations in descending order.

TABLE 2. HIGH ACCIDENT LOCATIONS

LOCATION	ACCIDENTS
US 21 AND NC 18	16
US 21 AND DOUGHTON	11
US 21 AND SR 1172	10
NC 18 AND GRAYSON	9
US 21 AND CHEEK	8
US 21 AND HANES	6
US 21 AND KEMP	5

US 21 has 5 high accident locations, NC 18 has 1 and the intersection of NC 18 with US 21 accounts for the remaining location (See Figure 7). US 21 experienced 56 of the 65 accidents, including 16 at the intersection of NC 18. The majority of accidents were left turn movements and rear-end collisions. These type accidents are consistent throughout the remaining accident locations on US 21. Also, 12% of the accidents on US 21 were parking related. The intersection of NC 18 with Grayson street had 9 accidents over the past 3 years. Angle accidents (6) were the most common.

ACCIDENT LOCATIONS
MAY 1988 - MAY 1991

LEGEND

- ● 5 - 10 ACCIDENTS
- ⬢ 11 - 15 ACCIDENTS
- ▲ > 15 ACCIDENTS

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH

IN COOPERATION WITH

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200

SCALE IN FEET

FIGURE 7

The purpose of calculating the capacities of the major links in the street network is to know how well the network could serve 2020 traffic and whether or not there would be any major deficiencies. With this objective in mind, the 2020 travel desires were assigned to the existing major street system. Deficient corridors created by the assigning of 2020 traffic to the existing network were then observed as discussed in Chapter III.

Presently, one deficient corridor exists in the Sparta planning area. A small section of US 21 between Sunset Drive and the South City Limits currently operates above capacity. By the design year, both NC 18 and US 21 through Sparta will be deficient if new roads are not constructed.

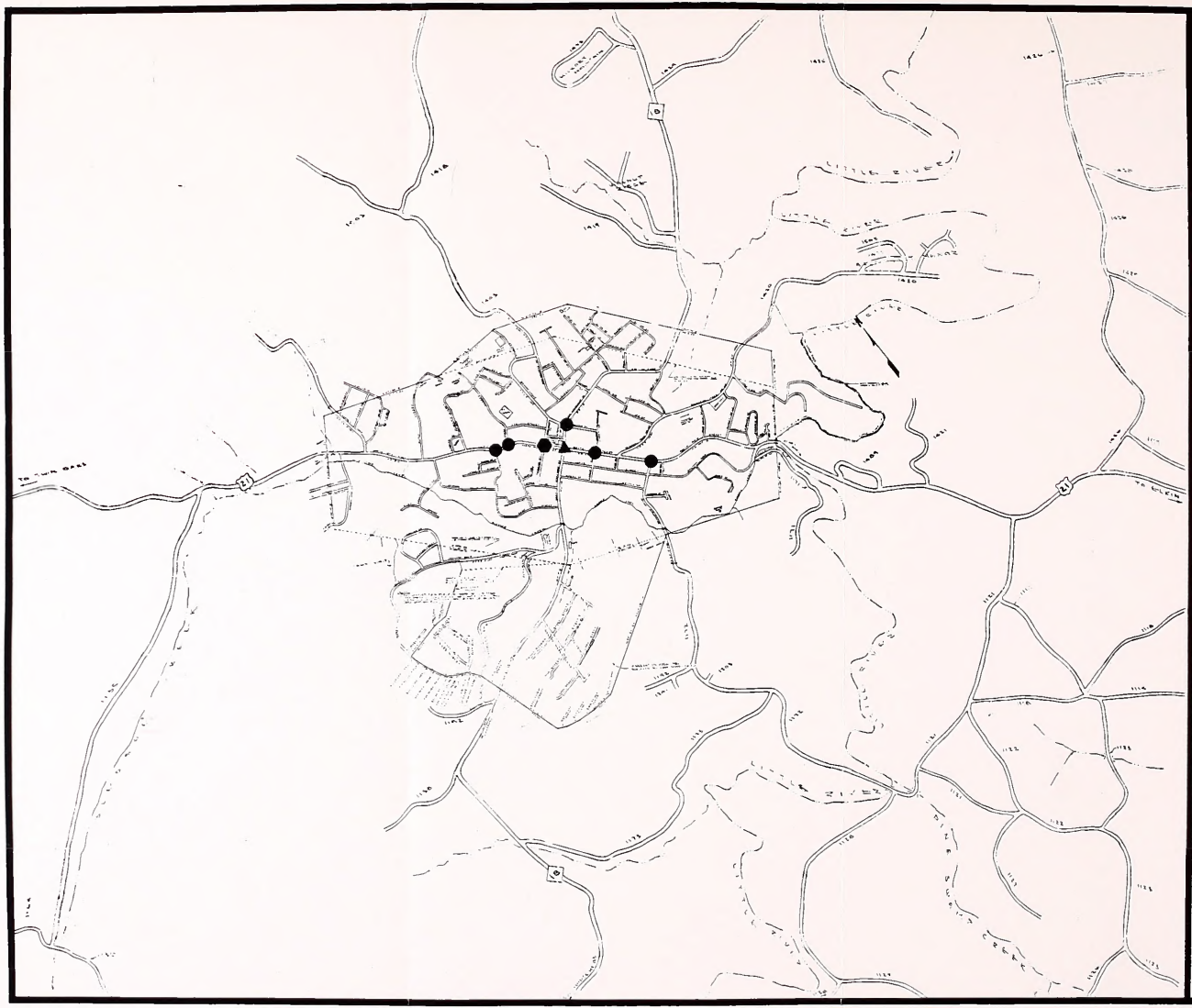
Traffic Accident Statistics

Accident records for May 1988 through May 1991 were investigated to determine high accident locations within Sparta. Targeted Areas had 5 accidents or more over the past 3 years. The investigation yielded seven locations, totaling 65 accidents. Table 2 has a list of the locations in descending order.

TABLE 2. HIGH ACCIDENT LOCATIONS

LOCATION	ACCIDENTS
US 21 AND NC 18	16
US 21 AND DOUGHTON	11
US 21 AND SR 1172	10
NC 18 AND GRAYSON	9
US 21 AND CHEEK	8
US 21 AND HANES	6
US 21 AND KEMP	5

US 21 has 5 high accident locations, NC 18 has 1 and the intersection of NC 18 with US 21 accounts for the remaining location (See Figure 7). US 21 experienced 56 of the 65 accidents, including 16 at the intersection of NC 18. The majority of accidents were left turn movements and rear-end collisions. These type accidents are consistent throughout the remaining accident locations on US 21. Also, 12% of the accidents on US 21 were parking related. The intersection of NC 18 with Grayson street had 9 accidents over the past 3 years. Angle accidents (6) were the most common.



ACCIDENT LOCATIONS
MAY 1988 - MAY 1991

LEGEND

- ● 5 - 10 ACCIDENTS
- ⬢ 11 - 15 ACCIDENTS
- ▲ > 15 ACCIDENTS

SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 7

The severity of accidents at the seven locations were moderate. There were 17 injury accidents totaling 22 injuries and no fatalities. The intersection of US 21 with NC 18 had the most injuries with eight. The concentration of accidents along US 21 in the center of town correlates to the higher traffic volumes in this area. Based on the increased traffic projections for this area it is a necessity to alleviate the accident potential of US 21. Various methods can be used to reduce the stress on US 21, change the existing cross-section, reduce driveways and development, or create a new route.

IV. MUNICIPAL AND PUBLIC INVOLVEMENT

In July, 1992, the Department of Transportation received a request from the Town of Sparta asking for assistance in developing a long range transportation plan for the Town. The first field trip to Sparta was made on August 13, 1991, and the study was officially underway.

On August 27, 1991, engineers met with the Town Council and the Planning Board to discuss the goals and expectations of the study. Initial thoughts were given regarding potential alternates that might relieve congestion at the existing US 21 - NC 18 intersection, a primary objective of the study. Some of the ideas were well received and a subsequent meeting was scheduled for September 16, 1991, to more fully explore alternates.

At the September meeting, a petition was presented to the Town Council and Planning Board members by the a member of the Concerned Citizens Committee opposed to a US 21 Bypass. A lengthy discussion followed with points made for and/or against almost all the alternates discussed. The Department was charged to evaluate all the comments and to come back to a public information meeting in November.

On November 7, 1991, the Town Council conducted a public information meeting soliciting public views regarding the proposed plans. This meeting followed the lines of the September meeting with representatives of the Concerned Citizens Committee voicing opposition to a US 21 Bypass and expressing concerns for the continued vitality of the local business community. The meeting concluded with the Town Council setting a public hearing date.

A public workshop and public hearing were held on January 23, 1992, on the plan recommended by the Department. At the hearing, a representative of the Concerned Citizens Committee asked to present their plan and did so along with numerous letters expressing concern that should an alternate to US 21 be adopted, the business community of Sparta would "be devastated". The Department's representative presented the recommended plan noting that the recommended US 21 Alternate passed primarily through NCDOT property and land acquired by the County for an industrial park, neither of which were subject to commercial development which would pose a threat to local retail business.

On February 4, 1992, the Town Council of Sparta adopted the plan recommended by the Department and asked that the portion of the US 21 Alternate from NC 18 East to US 21 North be deleted from the plan. The Department concurred in this request and modified the recommended plan to reflect that as shown on the Sparta Thoroughfare Plan, map dated February 4, 1992.

V. SPARTA THOROUGHFARE PLAN

A thoroughfare plan is a long range transportation study, which considers population and traffic trends, land use, and economics. The Sparta Thoroughfare Plan was created to provide the Town and State direction in the development of an efficient and safe street system. (See Appendix A for Thorough Plan Street Tabulation and recommendations)

The existing street system relies on one intersection in the center of Town, which is typical of a radial system. The Sparta street system is inefficient, because through traffic along US 21 and NC 18 must compete with local traffic in the downtown area, and local traffic on radial streets use the US 21/NC 18 intersection to travel to other radial streets. A system of connector roads between US 21 and NC 18 can relieve downtown congestion by providing alternative routes designed to carry traffic from one radial to another. The Thoroughfare Plan recommendations are intended to satisfy existing and future street system deficiencies and produce a balanced street network.

Major Thoroughfare System

US 21 - US 21 is a major arterial, which bisects Sparta. The section of US 21 inside the city limits between Charles Street and Blue Ridge Street is three-lanes, with on-street parking between Doughton Street and Cheek Street. The remainder of US 21 to Virginia and I-77 is two-lanes. The existing facility will provide adequate traffic service for a number of years, however, by 2020 the three-lane section should be extended to the city limits north and south of Town and parking removed from the street. US 21 is the most important traffic artery in the planning area and experiences the majority of traffic accidents in the Town. The recommended improvements will increase capacity and reduce accidents.

NC 18 - NC 18 runs directly through the center of Town and intersects US 21 in the downtown area. NC 18 is an important local artery, which provides access to residential development, the county hospital, and potential industrial development. NC 18 also provides a route to I-77 north of Sparta. NC 18 is a two-lane road through Sparta, with pavement 20 ft. wide between the south city limits and Jones Street and the north city limits and Hospital Drive. These sections should be upgraded to two 12ft. lanes, thereby increasing traffic safety.

SR 1172 (Grandview Drive) - SR 1172 is a major collector, which provides access to US 21 from the south. Land use along SR 1172 is primarily farmland and residential. The existing 18 ft. wide, two-lane facility is adequate to meet future travel demands, but should be widened to 12 ft. lanes to increase traffic safety.

US 21 Alternate - An alternate to US 21 would serve as a series of connector roads and provide through traffic with a bypass of the US 21/NC 18 intersection. More importantly, local traffic would have another option to the US 21/NC 18 intersection. The US 21/NC 18 connector south of Town would create a route to the shopping center on US 21 and utilize the SR 1172 collector. It would also create an access to the proposed industrial park between Grandview Drive and NC 18. The proposed alternate is a two-lane facility with 12 ft. lanes.

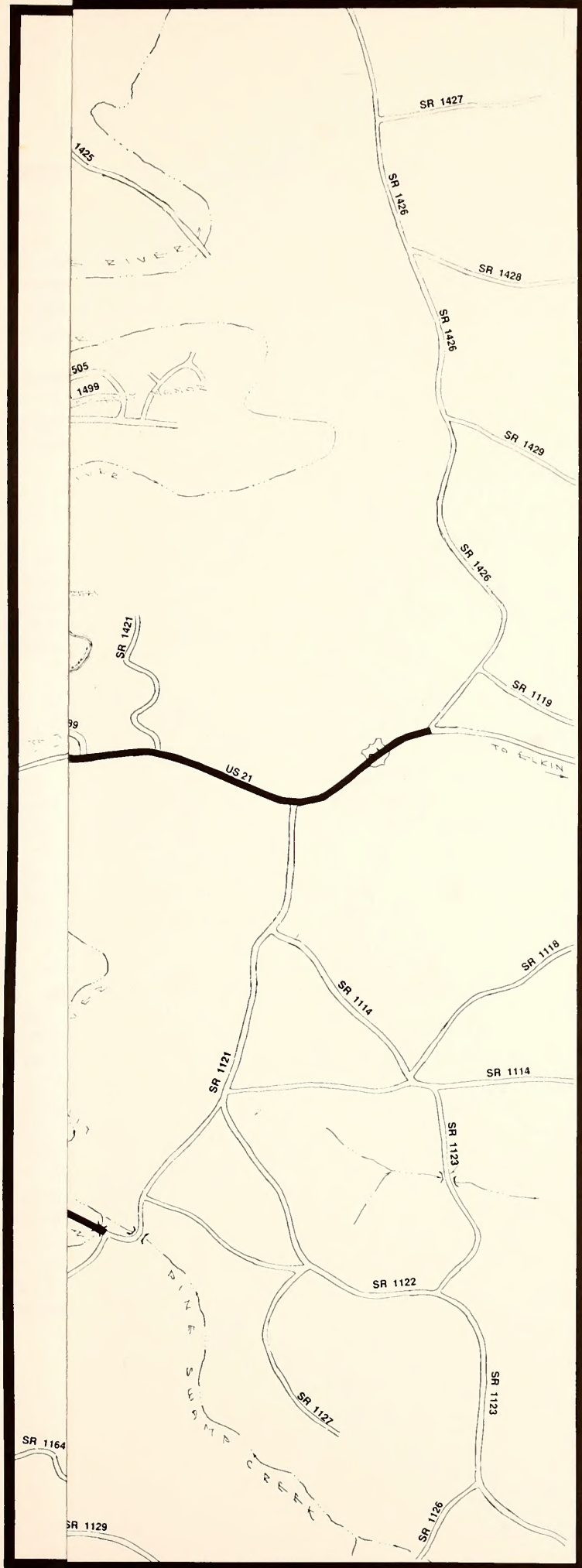
Blue Ridge Street Extension - A Blue Ridge Street extention would provide a circumferential connector from US 21 to NC 18. The connector would allow residents north of Town access to the shopping center on US 21 south of Town and furnish trucks with an alternate to local streets and the US 21/NC 18 intersection. The proposed facility is a two-lane road with 12 ft. lanes. Blue Ridge Street should be widened accommodate two 12 ft. lanes.

Minor Thoroughfare System

Duncan Street and Gentry Street - Duncan Street and Gentry Street connect Grandview Drive and NC 18. The existing facility is a two-lane pavement 16 ft. wide. The road should be upgraded to a modern two-lane facility, which would create an alternate to the US 21/NC 18 intersection for travel between US 21 and NC 18 south of Town.

South Grayson Street Extension - The extension of South Grayson Street to Memorial Park Drive would provide a parallel street to US 21 south of NC 18. The extension would also create a route to the Post Office and an alternate route to the shopping center on US 21 south of Town, provided there is direct access. South Grayson Street and South Grayson Street Extension should be a modern two-lane facility.

Memorial Park Drive - Memorial Park Drive provides access to US 21 from the north. The existing facility is adequate to carry future traffic, but should be widened to 12 ft. lanes for traffic safety purposes.



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES	▬▬	▪▪▪▪
MINOR THOROUGHFARES	──	- - -

ADOPTED BY:

TOWN OF SPARTA FEBRUARY 4, 1992

STATEWIDE PLANNING BRANCH FEBRUARY 20, 1992

N.C. DEPARTMENT OF TRANSPORTATION

PUBLIC HEARING DATE JANUARY 23, 1992

REVISIONS

TOWN OF SPARTA	PLANNING AND ENVIRONMENTAL	N.C. DEPARTMENT OF TRANSPORTATION

THOROUGHFARE PLAN
SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH

IN COOPERATION WITH

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

FEBRUARY 4, 1992

0 800 1600 2400 3200

SCALE IN FEET

FIGURE 8

SR 1172 (Grandview Drive) - SR 1172 is a major collector, which provides access to US 21 from the south. Land use along SR 1172 is primarily farmland and residential. The existing 18 ft. wide, two-lane facility is adequate to meet future travel demands, but should be widened to 12 ft. lanes to increase traffic safety.

US 21 Alternate - An alternate to US 21 would serve as a series of connector roads and provide through traffic with a bypass of the US 21/NC 18 intersection. More importantly, local traffic would have another option to the US 21/NC 18 intersection. The US 21/NC 18 connector south of Town would create a route to the shopping center on US 21 and utilize the SR 1172 collector. It would also create an access to the proposed industrial park between Grandview Drive and NC 18. The proposed alternate is a two-lane facility with 12 ft. lanes.

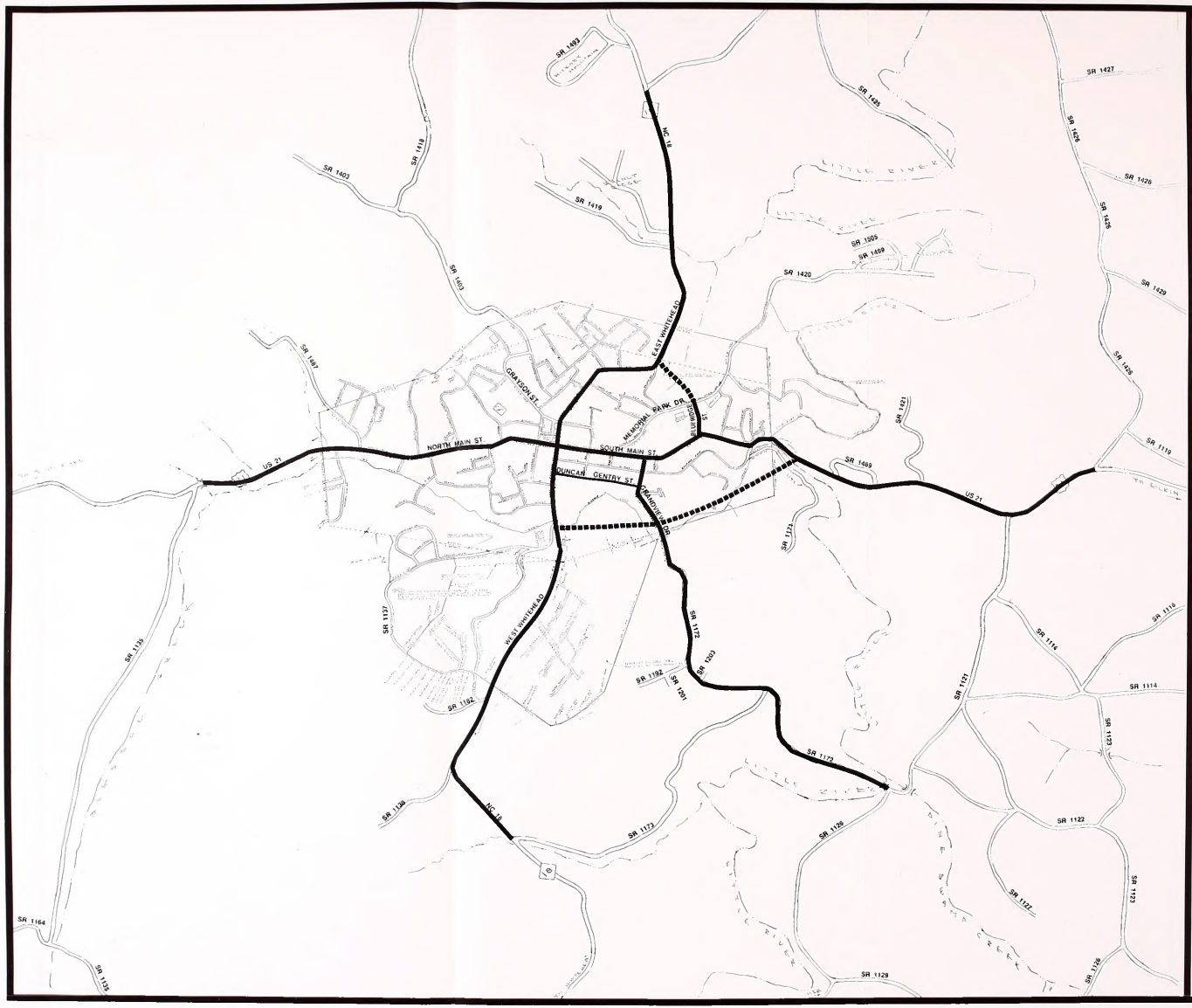
Blue Ridge Street Extension - A Blue Ridge Street extention would provide a circumferential connector from US 21 to NC 18. The connector would allow residents north of Town access to the shopping center on US 21 south of Town and furnish trucks with an alternate to local streets and the US 21/NC 18 intersection. The proposed facility is a two-lane road with 12 ft. lanes. Blue Ridge Street should be widened accommodate two 12 ft. lanes.

Minor Thoroughfare System

Duncan Street and Gentry Street - Duncan Street and Gentry Street connect Grandview Drive and NC 18. The existing facility is a two-lane pavement 16 ft. wide. The road should be upgraded to a modern two-lane facility, which would create an alternate to the US 21/NC 18 intersection for travel between US 21 and NC 18 south of Town.

South Grayson Street Extension - The extension of South Grayson Street to Memorial Park Drive would provide a parallel street to US 21 south of NC 18. The extension would also create a route to the Post Office and an alternate route to the shopping center on US 21 south of Town, provided there is direct access. South Grayson Street and South Grayson Street Extension should be a modern two-lane facility.

Memorial Park Drive - Memorial Park Drive provides access to US 21 from the north. The existing facility is adequate to carry future traffic, but should be widened to 12 ft. lanes for traffic safety purposes.



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARES	———	▪▪▪▪▪
MINOR THOROUGHFARES	———	- - - -

ADOPTED BY:

TOWN OF SPARTA FEBRUARY 4, 1992

STATEWIDE PLANNING BRANCH FEBRUARY 20, 1992

N. C. DEPARTMENT OF TRANSPORTATION _____

PUBLIC HEARING DATE JANUARY 23, 1992

REVISIONS

TOWN OF SPARTA	PLANNING AND ENVIRONMENTAL	N.C. DEPARTMENT OF TRANSPORTATION

THOROUGHFARE PLAN
SPARTA
ALLEGHANY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-PLANNING AND ENVIRONMENTAL BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

FEBRUARY 4, 1992

0 800 1600 2400 3200
SCALE IN FEET

FIGURE 8

VI. CONSTRUCTION IMPROVEMENTS, BENEFITS, AND COST ESTIMATES

The suggested improvements in the Sparta Thoroughfare Plan are not intended to be created equal. In an effort to reflect the relative value of various improvements, an assessment has been made of the benefits that can be expected from each project. These benefits can then be compared to the projected costs involved.

Three principal measures of benefits were used: road user cost savings, the potential for increased economic development resulting from the improvement, and the environmental impact, both positive or negative, which might result. The first measure is an actual estimate of dollar savings, while the others are estimates of the probability of the resulting change.

Reduced road user costs should result from any roadway improvement, from a simple widening to the construction of a new roadway to relieve congested or unsafe conditions. Comparisons of the existing and the proposed facility have been made in terms of vehicle operating costs, and accident costs. These user benefits are computed as total dollar savings over the 20 year design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume/capacity ratio.

The impact of a project on economic development potential is denoted as the probability that it will stimulate the economic development of an area by providing access to land with development potential and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (none) to 1.00 (excellent).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. Many of these have been accounted for in evaluating the project with respect to user benefits, cost, and economic development potential. The environmental analysis evaluates the impact of the project on the following: (1) air quality, (2) water resources, (3) soils and geology, (4) wildlife, (5) vegetation, (6) neighborhoods, (7) noise, (8) educational facilities, (9) churches, (10) parks and recreational facilities, (11) historic sites and landmarks, and (12) public health and safety. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impact of a project.

TABLE 3. ENVIRONMENTAL CONSIDERATIONS

ENVIRONMENTAL CONSIDERATIONS
Physical Environment
Air Quality
Water Resources
Soils and Geology
Wildlife
Vegetation
Social and Cultural Environment
Housing
Neighborhoods
Noise
Educational Facilities
Churches
Parks and Recreational Facilities
Public Health and Safety
National Defense
Aesthetics
Economic Environment
Businesses
Employment
Economic Development
Public Utilities
Transportation Costs
Capital Costs
Operation and Maintenance Costs

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. The highway costs estimated in this report are based on the average statewide construction costs for similar project types. An estimate of anticipated right-of-way costs is also included. Table 4 lists the proposed Sparta Thoroughfare Plan Projects with respect to user benefits, estimated costs, probability of economic development, and environmental impact.

Comparisons of various projects based on what criteria can be used as a guide in implementing the recommended improvements. Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that

improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the State's Transportation Improvement Program (TIP), a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. US 21 from the Sparta City Limits to Twin Oaks is scheduled for upgrading in 2000 and is currently listed as Project R-2302 on the 1991-1997 TIP.

TABLE 4. BENEFITS EVALUATION

PROJECT	USER BENEFITS $1000a	COST $1000b	ENVIRON. IMPACT	ECONOMIC IMPACT
Blue Ridge St. Extension	7,492	R-4 C-375	-0.10	+0.50
US 21 - NC 18 Connector	9,315	R-23* C-2,005	-0.40	+0.75
US 21 Alternate	11,017	R-41* C-3,654	-0.60	+0.75
Duncan St.-Gentry St. widening	200	R-5 C-250	-0.10	+0.10
NC 18 widening Hospital Dr.-NCL	2,247	R-10 C-250	-0.10	--
NC 18 widening Jones St.-SCL	1,275	R-15 C-650	-0.10	--
SR 1172 widening US 21 to SCL	***	R-10 C-210	-0.10	--
US 21 widening Blue Ridge ST.-SCL	2,066	C-220	-0.20	-0.10
US 21 widening Charles St.-NCL	2,368	C-375	-0.10	--

a/ Summation of estimated operating cost, user time, and accident cost savings, 1990-2010
b/ R-estimated right-of-way cost, C-Estimated construction cost, 1990 Dollars
*/ includes $15,000 for NCDOT property and $8,000 for county property
***/ Safety improvement project

The recommended major construction projects do require consideration of environmental impacts. The proposed US 21 Alternate will require a major structure across the Little River and two minor crossings of Bledsoe Creek. The proposed crossing are nearly perpendicular to the stream channels, are unavoidable, and impacts can be minimized with best management practices. The major impact to developed property will be to the existing NCDOT Maintenance facility off Grandview Road. This impact is preferable to environmental impacts associated with a longitudinal encroachment in the Bledsoe Creek floodplain. At the crossing of Grandview Drive, one - two residences will be impacted. Bledsoe Creek meanders through the Alleghany County Industrial Park property and it is assumed that in the development of the property, that Bledsoe Creek will rechanneled to minimize all development impacts.

The proposed extension of Blue Ridge Street will go through open pasture land and is not expected to adversely impact the environment. Other streets recommended for widening will have some minor impact on adjacent developed properties.

VII. ADMINISTRATIVE CONTROLS AND IMPLEMENTATION TOOLS

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a thoroughfare plan, the plan may be adopted by the governing body of the municipality and the Department of Transportation to serve as the basis for future street and highway improvements. The General Statutes also require that, as part of the plan, the governing body of the municipality and Department of Transportation shall reach agreement on responsibilities for existing and proposed streets and highways included in the plan. Facilities which are designated a State responsibility will be constructed and maintained by the Division of Highways. Facilities which are designated a municipal responsibility will be constructed and maintained by the municipality.

After mutual plan adoption, the Department of Transportation will initiate negotiations leading to determining which of the existing and proposed thoroughfares will be a Department responsibility and which will be a municipal responsibility. Chapter 136, Article 3A, Section 136-66.1 of the General Statutes provides guidance in the delineation of responsibilities. In summary, these statutes provide that the Department of Transportation shall be responsible for those facilities that serve volumes of through traffic and traffic from outside the area to major business, industrial, governmental, and institutional destinations located inside the municipality. The municipality is responsible for those facilities that serve primarily internal travel.

Unless implementation is an integral part of the transportation planning process, the effort and expense associated with developing a plan is lost. To neglect the implementation process is a three-fold loss - the loss of the capital expenditures used in developing a plan, the opportunity cost of the capital expenditures, and more importantly the loss of the benefits that would accrue from an improved transportation system.

Administrative controls and implementation tools that can aid in the implementation process are generally available to municipalities through Federal and State Legislation. These controls and tools will be discussed in this chapter. They include: Subdivision Regulations, Zoning Ordinances, Official Maps, Urban Renewal, Capital Improvements Programs, and Development Reviews. Generally two issues play a major role in the implementation process - available finances and citizen involvement. Effective use of the controls and tools listed above are indicative of good planning and minimize the effects of limited finances and negative citizen reaction to

specific elements of a plan. It is through good planning that maximum use is made of every available dollar and that citizen involvement and approval of the transportation plan is obtained.

Available Controls and Tools

Subdivision Regulations

Subdivision regulations are locally adopted laws governing the process of converting raw land into building sites. From the planner's view, subdivision regulations are important at two distinct levels. First, they enable him to coordinate the otherwise unrelated plans of many individual developers. This process assures that provision is made for land development elements such as roadway right-of-way, parks, school sites, water lines and sewer outfalls, and so forth. Second, they enable him to control the internal design of each new subdivision so that its pattern of streets, lots, and other facilities will be safe, pleasant, and economical to maintain.

To be most effective, subdivision regulations and their administration must be closely coordinated with other local governmental policies and ordinances. Among the more important of these are the Comprehensive Growth Plan, Utilities Extension Master Plan, and Thoroughfare Plan.

In practice, subdivision regulations can provide some very positive benefits such as requiring portions of major streets to be constructed in accordance with the Thoroughfare Plan, or requiring subdividers to provide for the dedication and/or reservation of rights-of-way in advance of construction. These practices reduce the overall cost of the plan by having some costs borne by developers. Recommended Subdivision Ordinances are included in Appendix B.

Zoning Ordinances

Zoning is probably the single most commonly used legal device available for implementing a community's land-use plan. To paraphrase the U.S. Department of Commerce 1924 Standard Zoning Enabling Act, on which most present-day legislation is based, zoning may be defined as the division of a municipality (or other governmental unit) into districts, and the regulation within the districts of:

1. the height and bulk of buildings and other structures,
2. the area of a lot that may be occupied and the size of required open spaces,
3. the density of population, and
4. the use of buildings and land for trade, industry, residence, or other purposes.

The characteristic feature of the zoning ordinance that distinguishes it from most other regulations is that it differs from district to district, rather than being uniform throughout a city. Thus, a given area might be restricted to single-family residential development with minimum lot size requirements and setback provisions appropriate for development. In other areas, commercial or industrial development might be permitted, and regulations would be enacted to control such development. Building code provisions or sanitary regulations, on the other hand, normally apply to all buildings in a certain category regardless of where they may be situated within a city.

The zoning ordinance does not regulate the design of streets, utility installation, the reservation or dedication of parks, street rights-of-way, school sites, and related matters. These are controlled by subdivision regulations or possibly by use of an official map. The zoning ordinance should however, be carefully coordinated with these and other control devices.

The zoning ordinance could be used to help preserve the right-of-way necessary to build the connector from Four Seasons Boulevard to US 25 South. Land in this area is slowly being converted from residential to Office and Retail.

Official Maps

The roadway corridor official map (or official map) is a document, adopted by the legislative body of the community, that pinpoints and preserves the location of proposed streets against encroachment. In effect, the official map serves notice on developers that the State or municipality intends to acquire certain specific property. The official map serves as a positive influence for sound development by reserving sites for public improvements in anticipation of actual need.

The NCDOT position is that it will limit the use of official maps to large scale, fully access controlled facilities planned for rapidly developing areas outside of municipal jurisdictions. For projects within municipal jurisdictions, official maps should be prepared and adopted by the local government. Municipalities may adopt official maps that extend beyond its extraterritorial jurisdiction with approval from the Board of County Commissioners.

It should be recognized that an official map places severe but temporary restrictions on private property rights. These restrictions are in the form of a prohibition, for up to three years, on the issuance of building permits or the approval of subdivisions on property lying within an official map alignment. The three year reservation period begins with the request for development approval. This authority should

be used carefully and only in cases where less restrictive powers are found to be ineffective.

Requests for NCDOT to prepare and adopt an official map should be directed to the manager of the Program, Policy and Budget Branch. For cities contemplating the adoption of an official map, there are two ways in which the city may proceed. The first is to consider the official map statute as a stand-alone authority and use it as the basis for local adoption of an official map. Alternatively, the second approach is to adopt a local ordinance modeled after the statute, but modified to fit local circumstances and clarify the statute. Regardless of the approach taken, several procedural steps will need to be considered, such establishing procedures for consideration of variance petitions.

Once the project has been selected and the alignment determined, maps must be prepared that are suitable for filing with the County Register of Deeds Office. The map should show the proposed alignment in sufficient detail to identify the functional design and the preliminary right-of-way boundaries. Since the purpose of the map is to show the effect on properties along the project path, the existing property boundaries should be identified. As an additional requirement, within one year of the adoption of an official map, work must begin on an environmental impact study or preliminary engineering.

It is important to recognize the risks inherent in the adoption of an official map prior to completing the environmental studies. Projects to be funded using any federal funds require the unbiased evaluation of alternate alignments. This means that other alternatives will be studied and compared to the protected alignment[1].

The above information is only to serve as an introduction to official maps, and in no way provides the information necessary to begin development of an official map. The Program and Policy Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map projects should contact this Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Official Maps" at:

Programming, Policy and Budget Branch
NC Department of Transportation
P.O. Box 25201
Raleigh, North Carolina 27611

[1] "Guidelines for Municipalities Considering Adoption of Roadway Corridor Official Maps," prepared by NCDOT Program, Policy and Budget Branch.

Urban Renewal

Urban renewal plays a minor role in the transportation planning implementation process in terms of scope and general influence. However, under the right circumstances, renewal programs can make significant contributions. Provisions of the New Housing Act of 1974 (as amended) call for the conservation of good areas, rehabilitation of declining areas, and clearance of slum areas. In the course of renewal, it is important to coordinate with the Thoroughfare Plan to see if additional set-back or dedication of right-of-way is needed.

Continued use of the urban renewal programs to improve the transportation system is encouraged. Changes that can be made under this program are generally not controversial or disruptive given the trauma of the clearance of a significant area.

Capital Improvement Programs

Capital programs are simply the coordination of planning and money. The capital improvements program, with respect to transportation, is a long range plan for the spending of money on street improvements, acquisition of rights-of-way and other improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated a Division of Highways responsibility and advance purchase of right-of-way where such action is warranted.

Historically, cities and towns have depended, to a great degree, on Federal or State funding to solve their transportation problems. Chapter 136-Article 3A of the Road and Highway Laws of North Carolina clearly outlines the responsibilities and obligations of the various governmental bodies regarding highway improvements. North Carolina Highway Bill 1211, passed in 1988, limits the role of municipalities in right-of-way cost sharing for projects once they are programed in the NCDOT Transportation Improvement Program. Set-back regulations, right-of-way dedications and reservations play a major role in the ultimate cost of many facilities. Only in special cases will the municipality be able to enjoy the benefits of highway improvements without some form of investment.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation prior to access being allowed. Any development expected to generate large volumes of traffic

(e.g., shopping centers, fast food restaurants, large industries, etc.) may be comprehensively studied by staff from the Traffic Engineering, Planning and Environmental, and Roadway Design Branches of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility at minimal expense. Since the municipality is the first point of contact for developers, it is important that the municipality advise them of this review requirement and cooperate in the review process.

The Inner Connector is a prime example of where the development review process could make a difference in the final alignment and cost of the project. The development review process will also become important once the Clear Creek Road Interchange is built. There needs to be very close coordination between the City and the State in determining how this corridor will build out.

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are to be based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process."

2. Enact a bond issue to fund street improvements.

3. Continue to work with NCDOT to have local projects included in the Transportation Improvement Program (TIP).

4. Consider the possibility of specific projects qualifying for federal demonstration project funds.

5. Adopt a collector street plan that would assess buyer or property owners for street improvement.

6. Charge a special assessment for utilities. For example, water and sewer bills could be increased to cover the cost of street improvements.

TABLE 5. PROJECT FUNDING SOURCES

PROJECT	LOCAL FUNDS	TIP FUNDS	SECONDARY ROAD FUNDS	SMALL URBAN	INDUSTRIAL ACCESS
Blue Ridge St. Extension	X	X		X	
US 21 - NC 18 Connector		X			X
US 21 Alternate		X			
Duncan St.-Gentry St. widening	X			X	X
NC 18 widening Hospital Dr.-NCL		X		X	
NC 18 widening Jones St.-SCL		X		X	
SR 1172 widening US 21 to SCL			X		
US 21 widening Blue Ridge ST.-SCL		X		X	
US 21 widening Charles St.-NCL		X		X	

APPENDICES

APPENDIX A

Thoroughfare Plan Street Tabulation and Recommendations

Facility & Section	Existing X - Section Dist MI	Rdy FT	ROW FT	Practical Capacity Current (Future)	1990 ADTS	2020 ADTS	Recommended X - Section Rdway (Ult)	ROW (Ult)
US 21								
SPB-SCL	1.10	22	60	(11000)	4400	10700	L	100
SCL-Sunset Dr.	0.24	22	60	(15000)	7100	13000	I	ADQ
Sunset Dr-Blue Ridge St.	0.11	26	60	(15000)	7500	13000	I	ADQ
Blue Ridge-Memorial Prk.	0.40	34	60	15000	12000	15000	ADQ	ADQ
Memorial Prk.-NC 18	0.24	60	60	16000	12200	13000	ADQ	ADQ
NC 18-Charles St.	0.50	42	60	16000	10000	13000	ADQ	ADQ
Charles St.-NCL	0.60	20	60	(15000)	5000	11000	I	ADQ
NCL-WPB	1.00	20	60	(11000)	4000	10000	L	100
NC 18								
S Cordon-SCL	1.33	20	60	6500	1800	5000	ADQ	ADQ
SCL-Collins Rd.	0.76	20	60	(11000)	2300	5000	K	ADQ
Collins Rd.-Jones St.	0.29	20	60	(11000)	4300	6000	K	ADQ
Jones St.- US 21	0.06	26	NA	11000	4300	6000	ADQ	ADQ
US 21-Grayson St.	0.10	30	45	11000	3600	7600	ADQ	ADQ
Grayson St.-Hospital Dr.	0.32	24	60	11000	3600	7600	K	ADQ
Hospital Dr.-NCL	0.39	20	60	(11000)	1700	4000	K	ADQ
NCL-NPB	1.21	20	60	6500	1200	2000	ADQ	ADQ
SR 1172								
SPB-SCL	1.33	18	60	5000	500	1300	K	ADQ
SCL- US 21	0.35	18	60	(11000)	1700	5000	K	ADQ
Duncan St.								
NC 18-Cheek St.	0.14	16	30	(11000)	400	1500	K	60
Gentry St.								
Cheek St.-Grandview Dr.	0.24	16	30	(11000)	600	2000	K	60
Blue Ridge St.								
US 21-Memorial Park Dr.	0.19	NA	NA	(11000)	2100	5000	I	60
Blue Ridge St. Extension								
Memorial Park Dr.-NC 18	0.23	-	-	(11000)	----	3500	I	100
US 21 ALT.								
US 21 SCL-SR 1172	0.68	-	-	(11000)	----	8000	L	100
SR 1172-NC 18	0.42	-	-	(11000)	----	9200	L	100
NC 18-US 21 NCL	0.98	-	-	(11000)	----	6300	L	100

ADQ-Adequate
NA-Information not available
CL-City Limit
PB-Planning Boundary

APPENDIX B

Typical Cross Sections

Typical cross sections recommended by the Thoroughfare Planning Unit are shown in Appendix B, Figure 8, and listed in Table 3.

Cross section "A" is illustrative for controlled access freeways. The 46 foot grassed median is the minimum median width. Wider variations could result depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes, but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane probably would be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares where parking on both sides is needed as a result of more concentrated development.

Cross section "L" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk further away from the street to provide added separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

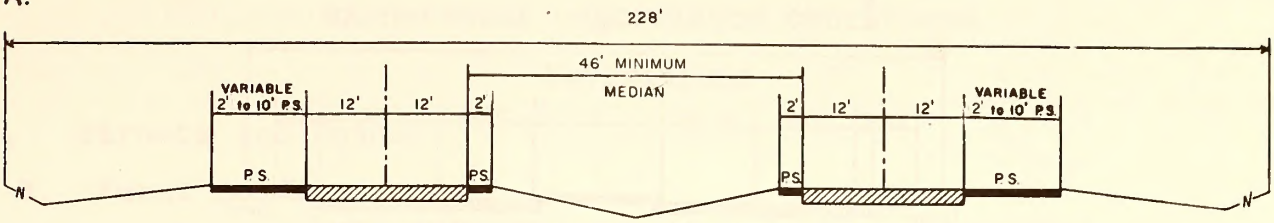
Rights-of-way shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle traffic along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to allow for the bicycle facilities. The North Carolina Bicycle Facility and Program Handbook should be consulted for design standards for bicycle facilities.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service and available right-of-way.

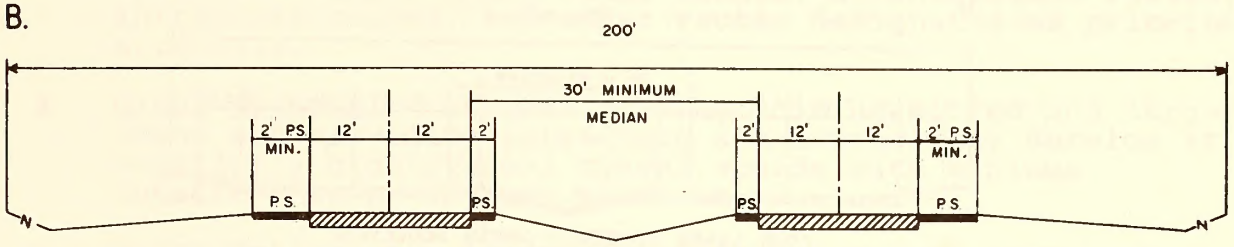
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



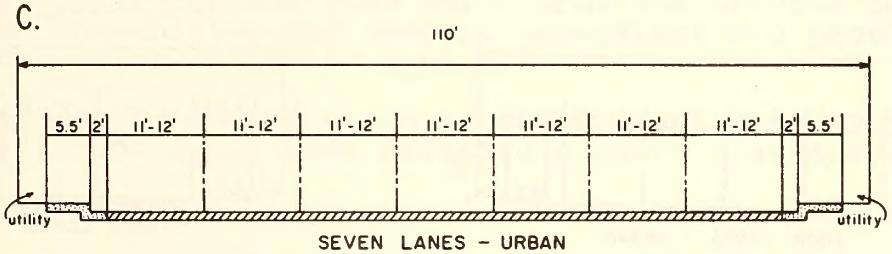
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



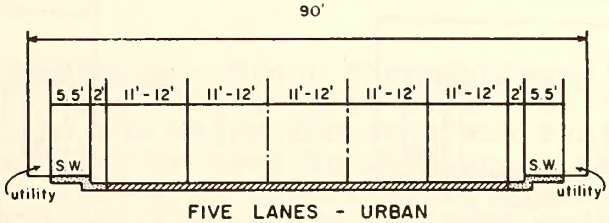
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



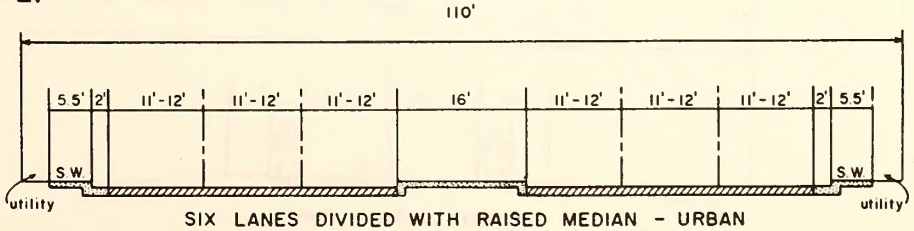
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

E.

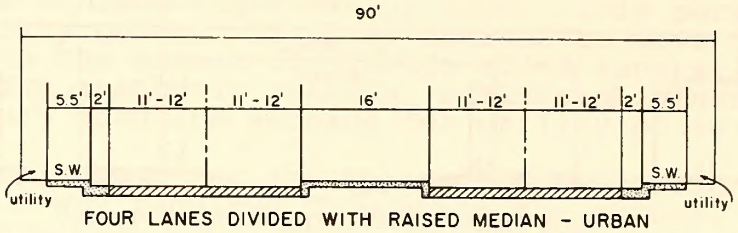


SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

FIGURE 9

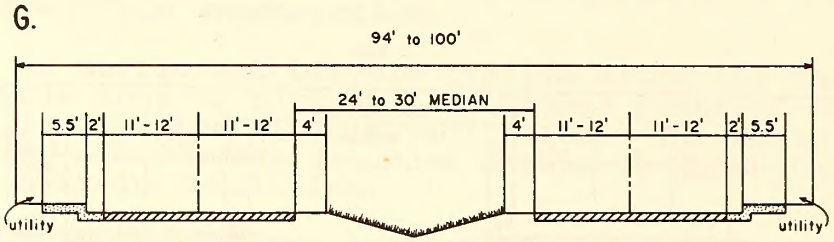
TYPICAL THOROUGHFARE CROSS SECTIONS
(CONTINUED)

F.



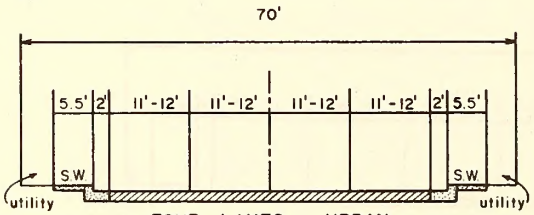
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



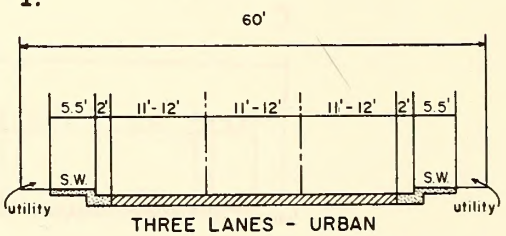
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



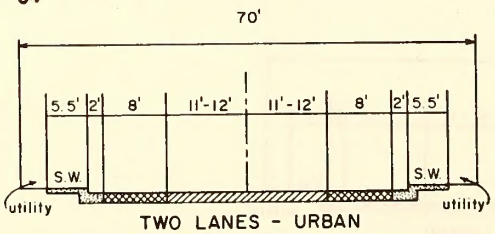
FOUR LANES - URBAN

I.



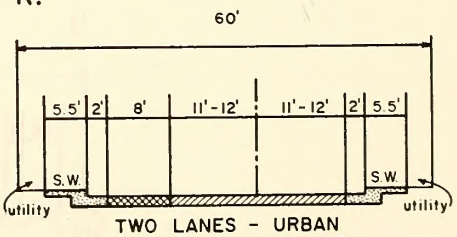
THREE LANES - URBAN

J.



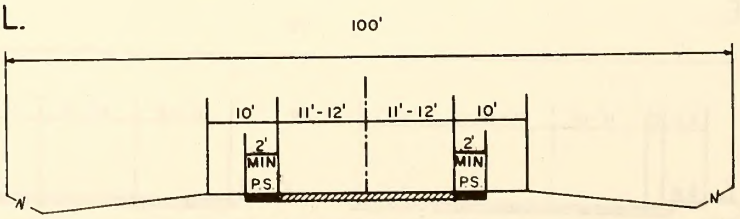
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.



TWO LANES - RURAL

APPENDIX C

RECOMMENDED SUBDIVISION ORDINANCES

Definitions

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of interstate routes, intrastate routes, and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intracounty travel corridors and traffic generators and provides access to the arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the major collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of interstate, intrastate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. (Design speed 70 mph, Operating speed 55 mph)

2. Secondary Freeway - A divided multilane roadway designed to carry moderate volumes of traffic at moderate speeds. The facility provides for the continuous flow of traffic through full control of access and the provision of interchanges or grade separation with no access at cross roads, and no traffic signals. (Design speed 50-55 mph, Operating speed 40-45 mph)

3. Parkway - A divided multilane roadway designed for noncommercial traffic, with full or partial control of access. Grade separations are provided at major intersections and there are no traffic signals.

4. Expressway - A divided multilane roadway designed to carry heavy volumes of traffic with full or partial control of access. Interchanges are provided at major intersections. There may be access to service roads and local streets, but there will be no signalized intersections.

5. Secondary Expressway - A divided multilane roadway designed to carry moderate volumes of traffic at moderate speeds. This facility may have partial control of access with right turn in and right turn out access to abutting property, and interchanges at major intersections. Some minor intersections may have traffic signal control.

6. Urban Arterial - Multilane roadway with signalized intersections, and access to abutting property. May have grass or barrier type median, or middle left turn lane.

7. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

8. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

9. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

10. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

11. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be built.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plot" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than ten acres where no street right-of-way dedication is involved; (3) widening or opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right of way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within Clayton shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the Town of Clayton.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

	Minimum ROW
1. Rural	
a. Principal Arterial	
Freeways	350 ft.
Other	200 ft.
b. Minor Arterial	100 ft.
c. Major Collector	100 ft.
d. Minor Collector	80 ft.
e. Local Road	60 ft.[1]
2. Urban	
a. Major Thoroughfare other than Freeway and Expressway	90 ft.
b. Minor Thoroughfare	70 ft.
c. Local Street	60 ft.[1]
d. Cul-de-sac	Variable[2]

---

[1] The desirable minimum right-of-way (ROW) is 60 ft. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn-around. Distance from edge of pavement of turn-around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn-around.

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principal and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than sixty feet in width may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local streets shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and Gutter section: 26 feet, face to face of curb
   Shoulder section: 20 feet to edge of pavement, 4 foot shoulders

2. Residential Collector
   Curb and Gutter section: 34 feet, face to face of curb
   Shoulder section: 20 feet to edge of pavement, 6 foot shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown on the following page.

DESIGN SPEEDS			
Facility Type	Design Speed		
	Desirable	Minimum	
		Level	Rolling
Rural			
Minor Collector Roads	60	50	40
Local roads including Residential Collectors and Local Residential	50	50*	40*
Urban			
Major Thoroughfares other than Freeways, Expressways, or Parkways	60	50	50
Minor Thoroughfares	60	50	40
Local Streets	40	40**	30**

2. Maximum and Minimum Grades

   a. The maximum grades in percent shall be:

   b. Minimum grade should not be less than 0.5%.

   c. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

MAXIMUM VERTICAL GRADE		
Design Speed	Terrain	
	Level	Rolling
60	4	5
50	5	6
40	6	7
30		9

---

* Based on projected annual average daily traffic of 400-750. In cases where road will serve a limited area and small number of dwelling units, minimum design speeds can be reduced further.

**Based on projected annual average daily traffic of 50-250.

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long, may be 50% greater than the value in the above table.

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum applicable sight distance shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1984."

SIGHT DISTANCE				
Design Speed	30	40	50	60
Stopping Sight Distance				
Minimum (ft.)	200	275	400	525
Desirable Minimum (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	80	160	310
Sag Curve	40	70	110	160

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)

4. The "Superelevation Table" below shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

---

* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide the desired sight distance.

SUPERELEVATION TABLE			
Design Speed	Maximum e*	Minimum Radius ft.	Max. Deg. of Curve
30	0.04	302	19 00'
40	0.04	573	10 00'
50	0.04	955	6 00'
60	0.04	1,528	3 45'
30	0.06	273	21 00'
40	0.06	509	11 15'
50	0.06	849	6 45
60	0.06	1,380	4 15'
30	0.08	252	22 45'
40	0.08	468	12 15'
50	0.08	764	7 30'
60	0.08	1,206	4 45'

e* = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees. No street should intersect a railroad at grade at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than five hundred (500) feet in length. The distance from the edge of pavement on the vehicular turn-around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn-around. Cul-de-

sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn-around facilities at the dead end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheelchair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

   a. Shoulder section approach

      i. Under 800 ADT design year

         Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

      ii. 800 - 2000 ADT design year

         Minimum 34 feet width face to face of parapets of rails or pavement width plus 12 feet, whichever is greater.

      iii. Over 2000 ADT design year

         Minimum width of 40 feet, desirable width of 44 feet width face to face of parapets of rails.

   b. Curb and gutter approach

      i. Under 800 ADT design year

         Minimum 24 feet face to face of curbs.

      ii. Over 800 ADT design year

         Width of approach pavement measured face to face of curbs.

         Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet of rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

   a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 8' minimum, 10' desirable.)

   b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.

STATE LIBRARY OF NORTH CAROLINA
3 3091 00006 2935